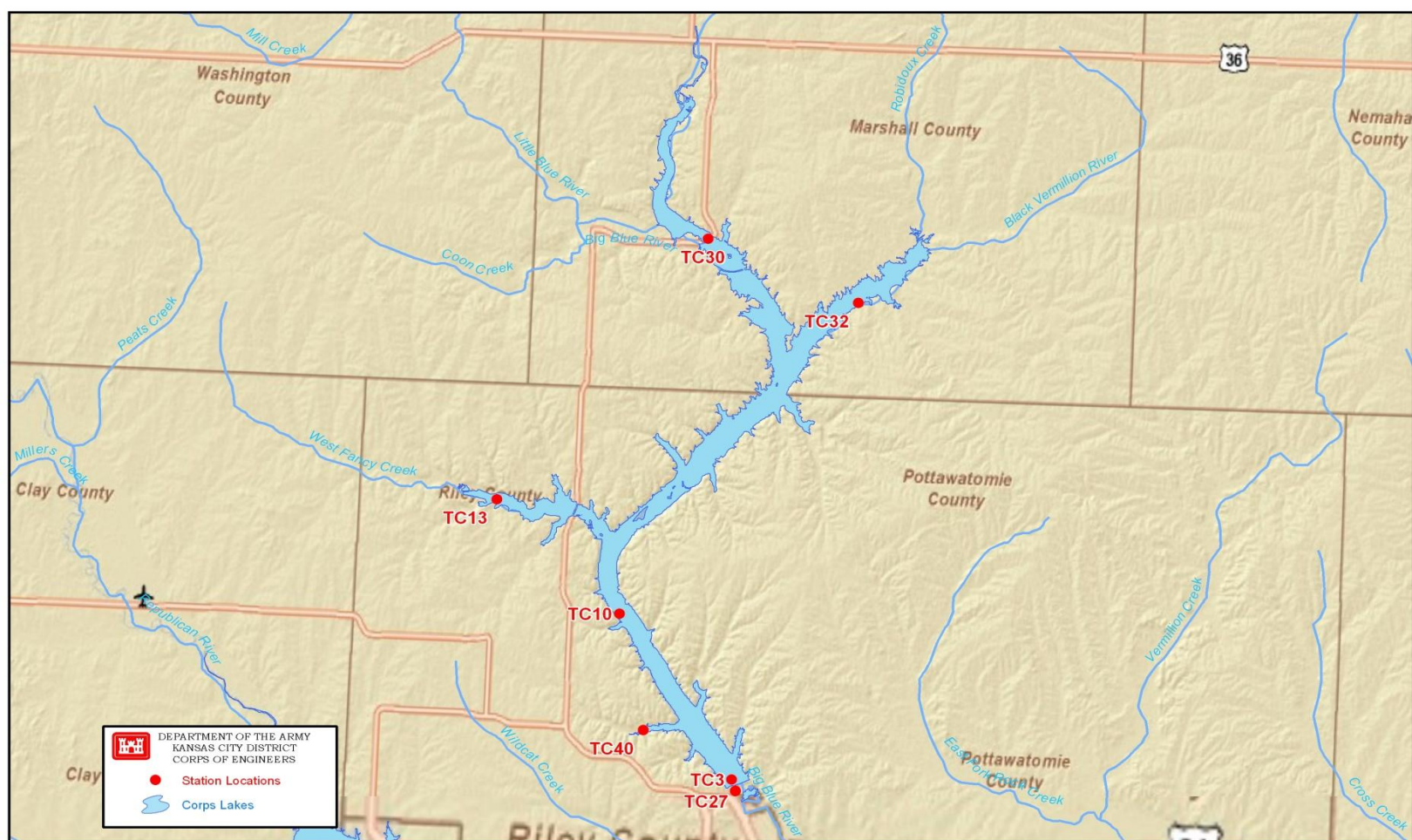


Tuttle Creek Lake Water Quality Summary

2005-2014

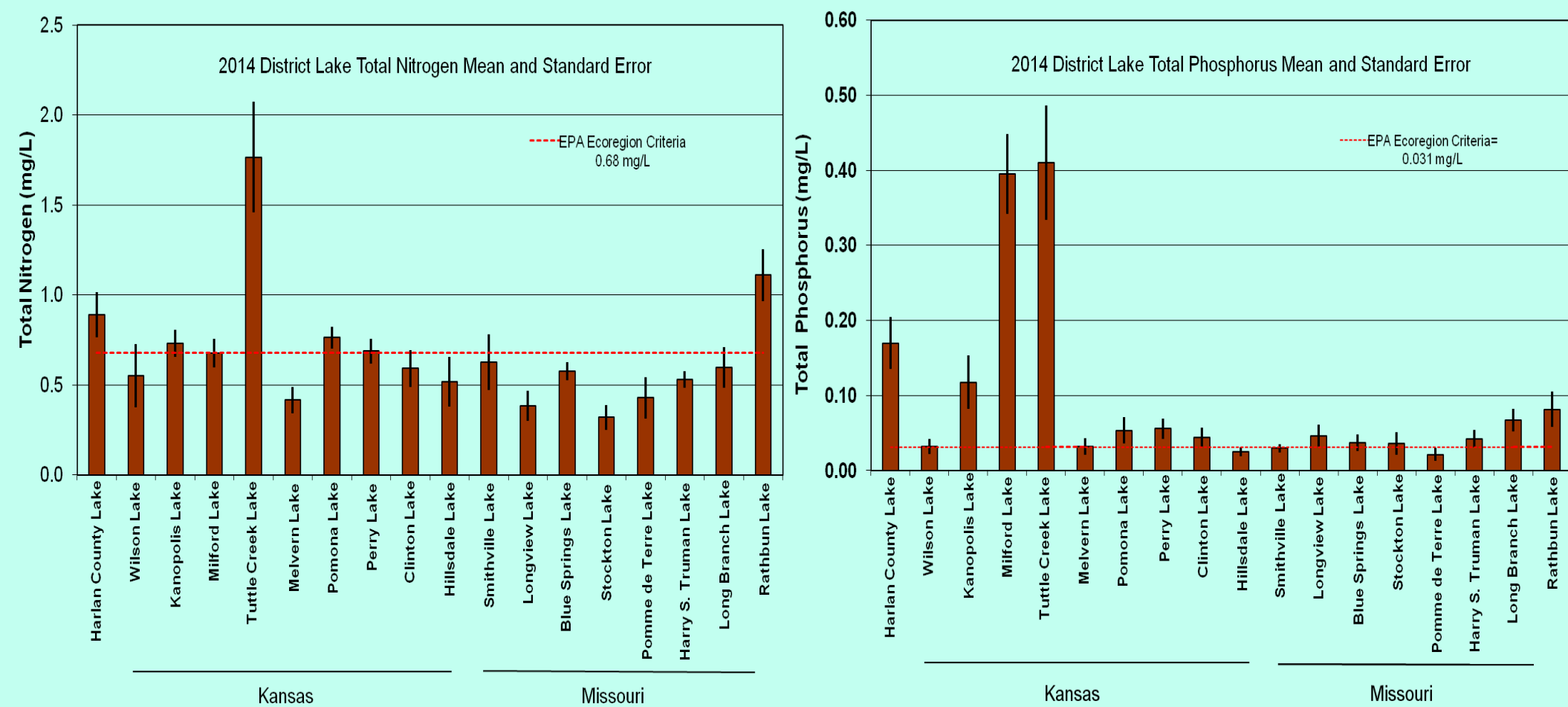


•Tuttle Creek Lake:

- Built on Big Blue River reaching full pool in 1963.
- **Watershed** = 9,628 square miles / 6,162,000 Acres (A)
- **Capacity:**
 - Flood Control: 1,884,312 Acre Feet (AF)/ 54,139 surface acres (SA)
 - Multipurpose: 257,014 AF ; 10,900 SA; 104 miles of shoreline
 - 10-year avg. annual inflow = 1,265,173 AF; 2014 inflow = 798,825 AF
- **Operating project purposes:** flood control, recreation, water quality improvement, water supply, navigation, and fish and wildlife management.

Nutrient Enrichment

Nutrients (i.e. phosphorus and nitrogen) are essential for aquatic life and are the primary factor driving fish and aquatic plant growth rates and productivity. Excess nutrients from urban, agricultural or natural sources increases the natural aging or eutrophication process in lakes. This can alter plant and aquatic life in lakes and water bodies, cause algal blooms, create low dissolved oxygen that affect fish survival, and lead to taste and odor issues in drinking water. The lack of sunlight penetration due to turbidity and suspended sediments in Tuttle Creek Lake limits plant/algae growth and other measures of productivity. Tuttle Creek Lake is listed as “impaired” on the 2014 Kansas 303(d) list due to accelerated eutrophication and siltation and has a TMDL for phosphorus and sediment load reduction since 2000. KDHE and EPA are working with water quality partners, landowners and an active Tuttle Creek Watershed Restoration and Protection Strategy (WRAPS) group. Together they provide recommended best management practices for target areas in the watershed to meet long term goals for Tuttle Creek Lake. Working in the watershed to reduce nutrient and sediment runoff will help slow the eutrophication process and reduce siltation improving water quality and increasing the life span of Tuttle Creek Lake. Tuttle Creek Lake frequently has the highest nutrient levels in the Kansas City District as observed in 2014. Standard error bars in the graphs below illustrate the variation in sample results from each site in 2014.

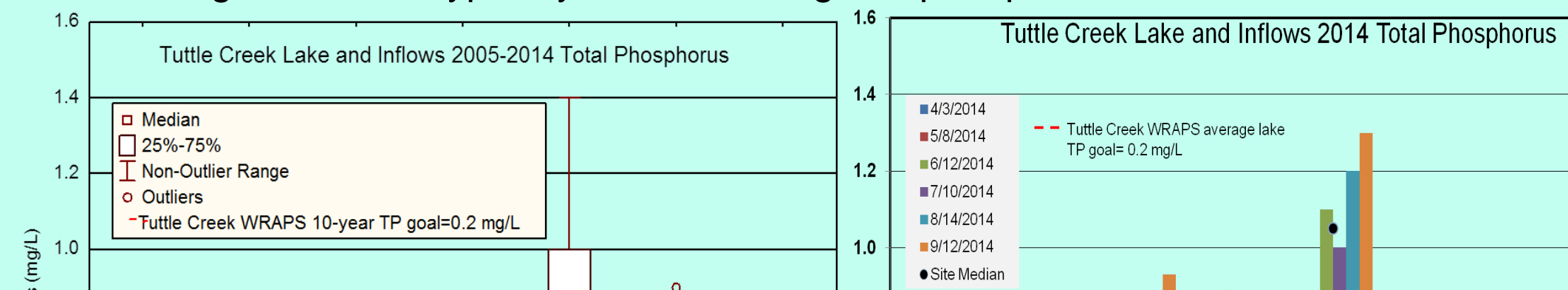


The **US Army Corps of Engineers** (USACE) Water Quality Program collects monthly water samples at Tuttle Creek Lake and inflows from April through September. These figures present data collected between 2005-2014 from 7 sites. The sites include inflow (#30, 32, 13, and 40), two lake sites (#3,10), and the outflow (#27). Thirty-four chemical, physical and biological parameters are measured to evaluate water quality. USACE uses this data to describe conditions and changes from the inflow streams, within the main lake, and outflow focusing on eutrophication, nutrients, sediment, herbicides, metals, and contaminants.

*Note: The term “lake” is substituted for technically correct “reservoir” throughout this document for consistency.

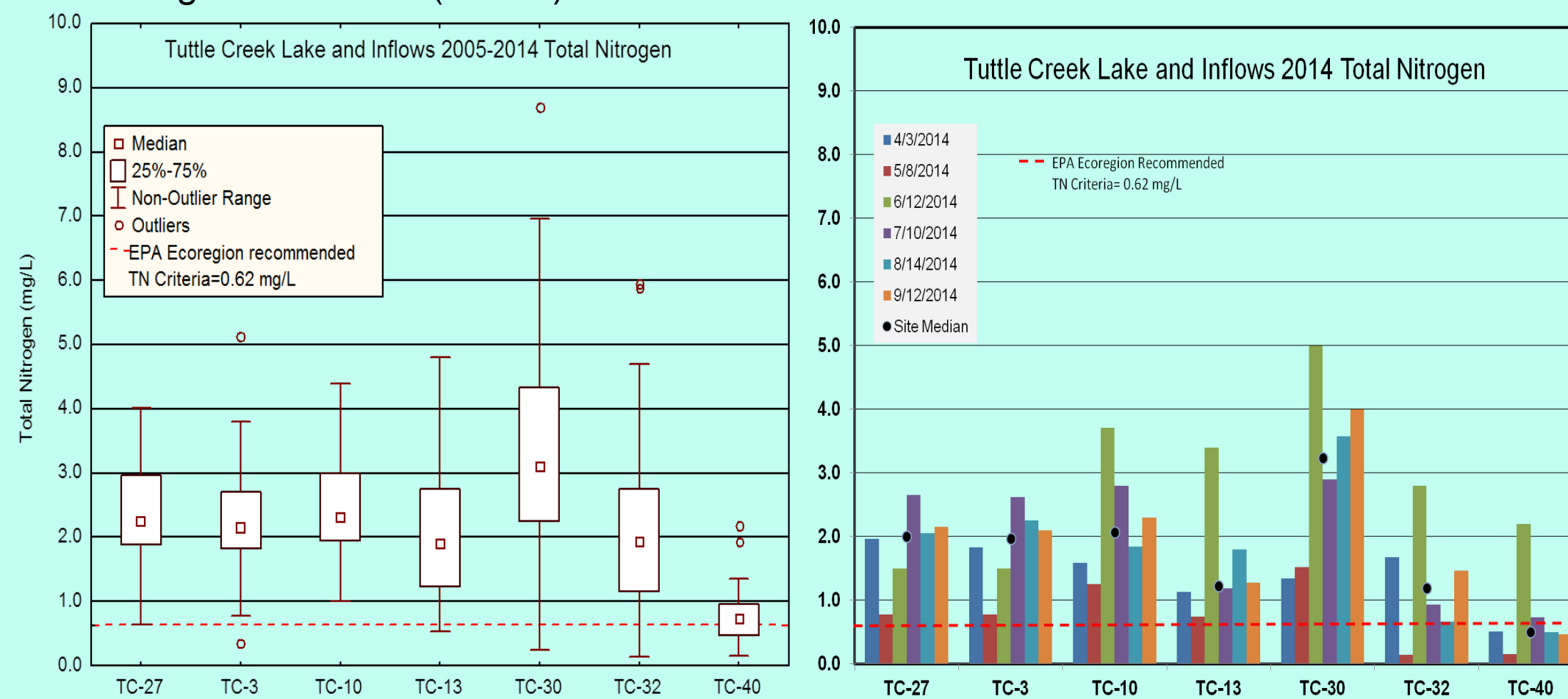
Total Phosphorus

Phosphorus levels in Tuttle Creek Lake exceed levels measured in other lakes which have toxic blue green algae blooms. Turbidity in Tuttle Creek Lake limits sunlight required for photosynthesis by algae and plants. The typical “muddy” appearance prevents blue-green algae blooms at Tuttle Creek Lake. Tuttle Creek Lake has high phosphorus loads, poor algal community and resulting fish community adaptable to murky water. Total phosphorus measured at inflow and lake sites in 2014 were similar to 10-year trends except TC-30 median TP exceeded 75% of the data collected since 2005. Big Blue River typically carries the highest phosphorus and sediment load.



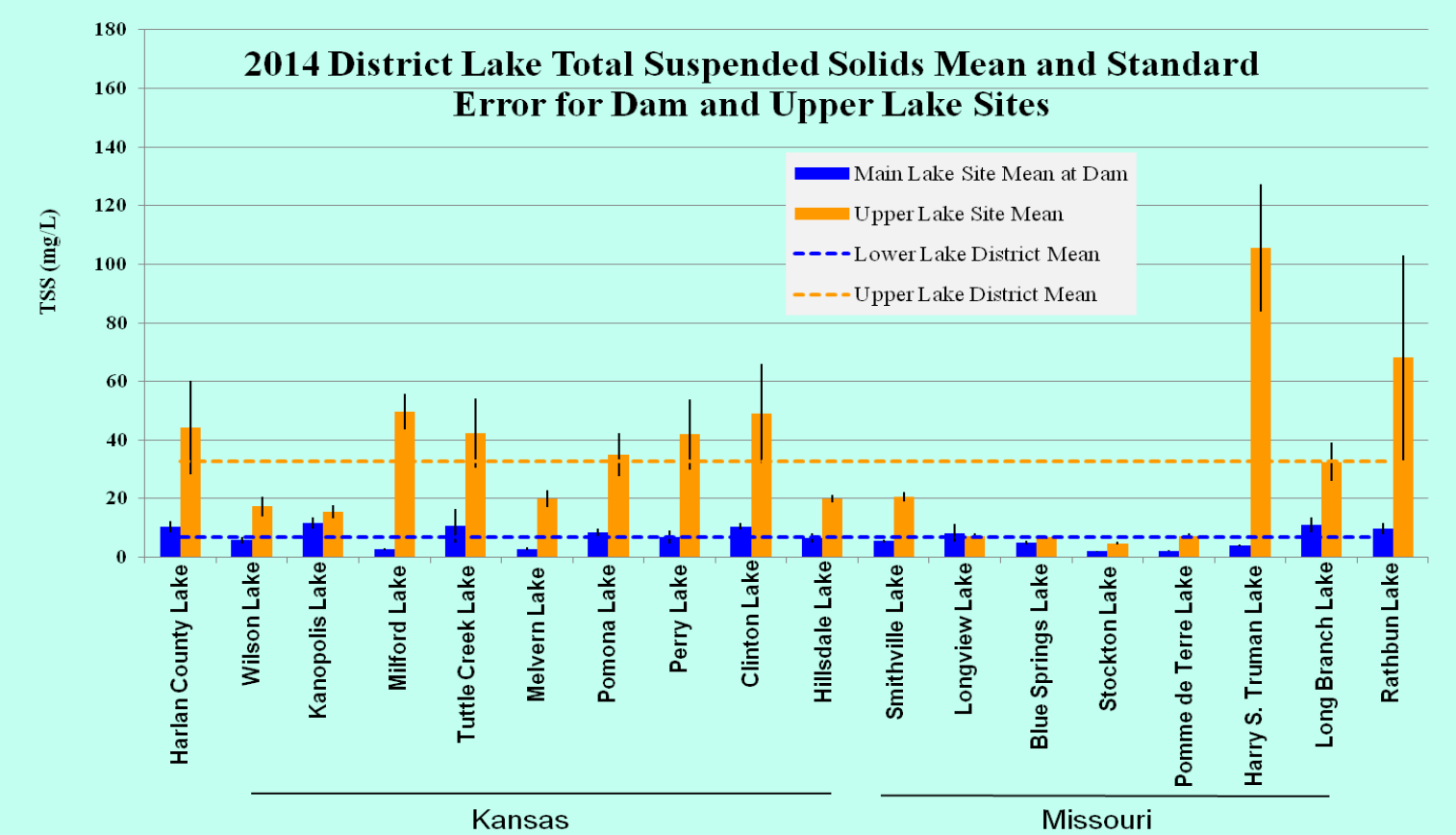
Total Nitrogen

Tuttle Creek Lake and its inflows have the highest nutrient load of all the District Lakes, including Total Nitrogen. Total nitrogen concentrations at all sites are frequently ten times higher than EPA Ecoregion criteria (0.62 mg/L) for the region. In 2014, median total nitrogen concentrations measured nearly three times higher than the EPA Ecoregion recommendations. The highest concentrations are measured from Big Blue River (TC-30). Total nitrogen concentrations are highly variable between sites and years mostly related to inflow discharge and upstream land use. Biological attenuation or algae uptake of nutrients at Tuttle Creek Lake is low. Consequently, high concentrations of nitrogen and phosphorus are measured from the lake and pass through the outflow (TC-27).



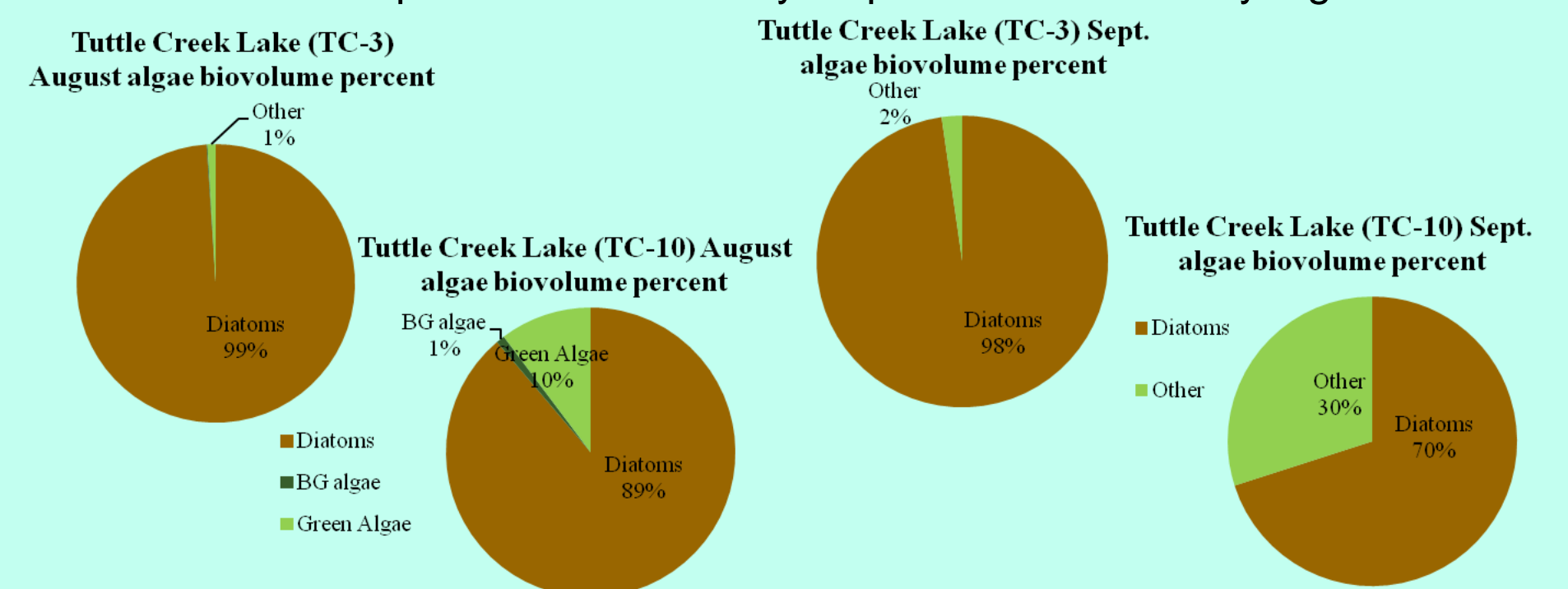
Total Suspended Solids

Total suspended solids (TSS) or filterable solids in streams and lakes is a function of watershed characteristics including soil composition, land use, weather patterns, and characteristics of inflowing streams. TSS is an indicator of erosion in watersheds, sedimentation or filling rates of downstream reservoirs, and is also closely linked to nutrient and contaminant transport through river systems. In 2014, Tuttle Creek Lake was above the District average for TSS at the upper and lower lake sites. Similar to nutrient data, TSS is much higher in inflows and upper lakes sites than near the dam. Typically 75-85% of suspended matter settles out as water moves from the upper lake sites to the dam at Tuttle Creek Lake.



Algae

Algae and green plants are the base of the food chain in a lake and function to convert nutrients and CO₂ via photosynthesis into biomass for all aquatic life. In Tuttle Creek Lake, the algae community is repressed from lack of sunlight penetration due to turbid water and suspended sediment. August and Sept. phytoplankton sampling indicated that 70-99% of the algae species were diatoms in the upper and lower lake with 1% or less blue green algae. Algal cell counts were very low with maximum count at 2,334 cells/mL in one August sample. USACE toxin samples collected in July-Sept did not detect any algal toxins.



Water Quality Concerns:

- Eutrophication
- Nutrients
- Herbicides
- Sediment inputs



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Environmental Resources Section
Kansas City, MO